

CLAIMS:

1. A method of detecting an explosive material or composition, comprising:
irradiating an object with an optically-generated pulse of electromagnetic radiation, said pulse having a plurality of frequencies in the range from 100 GHz to 100 THz;
detecting radiation transmitted and/or reflected from the object;
identifying one or more features of the detected radiation which are indicative of a known explosive material or composition.
2. A method of detecting an explosive material, comprising:
irradiating an object with an optically-generated beam of substantially continuous electromagnetic radiation having a frequency in the range 100 GHz to 100 THz;
detecting radiation transmitted and/or reflected from the object;
identifying one or more features of the detected radiation which are indicative of a known explosive material or composition.
3. The method of claim 1 or 2 wherein the identification of one or more feature comprises determining whether the detected radiation is indicative of a fundamental property of one or more explosive materials/compositions.
4. The method of any preceding claim wherein the analysis of the detected radiation comprises determining a frequency spectrum from the detected radiation.
5. The method of claim 2 wherein the analysis of the detected radiation comprises obtaining a frequency spectrum at a number of predetermined frequencies and analysing the spectra at the predetermined frequencies to determine if features of known explosive materials are present.
6. The method of claim 4 or 5 wherein the frequency spectrum is an absorption spectrum.

7. The method of claim 4 or 5 wherein the frequency spectrum is a reflection spectrum.
8. The method of claim 4, 6 or 7 further comprising analysing the frequency spectrum at predetermined frequencies to determine if features of known explosive materials/compositions are present.
9. The method of claim 5 or 8 wherein the analysis comprises comparing the spectral intensity at the predetermined frequencies with expected intensities relating to one or more explosive materials/compositions.
10. The method of claim 5 or 8 wherein the analysis comprises calculating at least one ratio of spectral intensity at first and second predetermined frequencies and comparing with expected intensity ratios relating to one or more explosive materials.
11. The method of claim 10 wherein a plurality of intensity ratios are calculated for the spectral signature from a predetermined set of frequencies and are compared with expected intensity ratios relating to one or more explosive materials.
12. The method of any preceding claim further comprising obtaining a first derivative of the obtained spectra.
13. The method of claim 5, or 8 wherein at least one of the predetermined frequencies correspond to a region of low water absorption.
14. The method of any preceding claim further comprising applying a measure to reduce water absorption effects in the detected radiation.
15. The method of claim 14 wherein the effects of water absorption are reducing by reducing the resolution in the analysis of the detected radiation.

16. The method of any preceding claim wherein said explosive material or composition is covered with a member, said method further comprising compensating for the signal due to the member by differentiating the detected radiation.
17. The method of claim 16 wherein the signal is compensated for by obtaining the first derivative of a frequency spectrum of the detected radiation.
18. The method of any preceding claim wherein the radiation is in the frequency range of 500 GHz to 100 THz.
19. The method of any preceding claim wherein the radiation is in the frequency range of 1 THz to 100 THz.
20. The method of any preceding claim wherein the radiation is in the frequency range of 700 GHz to 10 THz.
21. The method of any one of claims 1 to 3 wherein the analysis comprises:
 - obtaining a measure relating to the time-of-flight of the detected radiation reflected off a rear surface of the object;
 - obtaining a measure relating to the absorption of the objection from the time-of-flight measure;
 - determining whether the object is an explosive material from the absorption measure.
22. The method of claim 2 further comprising:
 - determining whether a reference beam at the detector is in phase with the detected radiation; and
 - adjusting the detected radiation by at most $\frac{1}{2}$ a period to achieve an in-phase.
23. An explosive detection apparatus, comprising:
 - an optically-driven emitter for irradiating an object with a beam of substantially continuous electromagnetic radiation having a frequency in the range 100 GHz to 100 THz;

means for detecting radiation transmitted and/or reflected from the object,
analyser for analysing the detected radiation to determine if one or more
predetermined features of an explosive material exists.

24. An explosive detection apparatus, comprising:
an optically-driven emitter for irradiating an object with a pulse of
electromagnetic radiation, said pulse having a plurality of frequencies in the range from
100 GHz to 100 THz;
means for detecting radiation transmitted and/or reflected from the object;
analyser for analysing the detected radiation to determine if one or more predetermined
features of an explosive material exists.
25. The apparatus of claim 23 or 24 wherein the analyser calculates a frequency
spectrum from the detected radiation.
26. The apparatus of claim 25 further comprising a comparator for comparing the
calculated spectrum with one or more known spectra of explosive
materials/compositions to determine whether a likeness exists.
27. The apparatus of claim 26 wherein the known features are indicative of a
fundamental property of the explosive material.
28. A method substantially as herein described with reference to the accompanying
drawings.
29. An apparatus substantially as herein described with reference to the
accompanying drawings.